DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
SPECIFICATION

COMMON DIGITIZER-2 (CD-2)

This specification change forms a part of FAA-E-2679a, dated June 22, 1982, as modified by Amendment 1, dated May 30, 1985 and Specification Change 1, dated January 28, 1986.

Page 2, paragraph 1.1: Add subparagraph (c) as follows:

"(c) The CD-2 will include a remote maintenance and monitoring (RMM) capability, as an integral function of the system. This capability, together with necessary ancillary equipment, will allow the CD-2 to be monitored and controlled locally or from a remote location. This capability shall be provided as required by the contract.".

Page 3, paragraph 1.2: Add the following immediately after the definition of the term "ARTCC":

"ASCII - American Standard Code for Information Interchange. A standard code of 128 alphabetical, numerical and control characters that is widely used in digital information exchanges.".

Page 10, paragraph 1.2: Add the following immediately after the definition of the term "rise time":

"RMM - Remote Maintenance and Monitoring. The functional capability of the CD-2 that, together with ancillary equipment, allows it to be remotely monitored and controlled for operation, maintenance and performance

assessment purposes. In certain contexts, the term may also refer to the same general capability of (or the equipment which provides such a capability for) other FAA systems and/or facilities.".

Page 14, subparagraph 2.3: Add the following immediately after the first subparagraph (which ends "...Employing Serial Binary Data Interchange."):

"Electronic Industries Association Standard RS-232C, Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange".

Page 19, paragraph 3.2.1: In the last subparagraph, add the following immediately after the second sentence (which ends "...via the maintenance console."): "The CD-2's remote maintenance and monitoring function shall reside in the maintenance console as well.".

Page 22, paragraph 3.3.2.2.1(d): Add the following immediately after the third sentence (which ends "... at the moment of the interruption."): "(The CD-2's maintenance test target and integral remote maintenance and monitoring (RMM) functions are considered to be part of the CD-2 operational equipment for the purposes of this requirement. In the event of a loss of its operational status information as the result of a lengthy power outage, the CD-2's RMM function shall be restored in its local command operating mode and the test targets shall be restored to default settings, but not be enabled.)".

Page 24, paragraph 3.4: In the second subparagraph from the end, delete the fourth sentence (which ends "... on the maintenance console."), and substitute the following: "Calibration, control, diagnosis and monitoring of both channels of the CD-2 shall be able to be accomplished by controlling these processing elements from either the local data entry facilities on the maintenance console or remotely via the console's RMM capability (3.4.3.1.6.1).".

Page 28, paragraph 3.4.1.3: Delete the sentence and substitute: "The STE, in addition to detecting aircraft targets, shall detect and report up to eight iso-intensity contours caused by weather within the coverage area of the associated search radar.".

Page 29, paragraph 3.4.1.6: Add the following immediately after subparagraph (e):

"(f)   Local control
 (g)   Remote control".

Page 39. Add the following immediately after paragraph 3.4.2.1.4.2, Alternate data transmission interface:

"3.4.2.1.4.3 Remote maintenance and monitoring interface.- The CD-2 shall be designed such that its remote maintenance and monitoring (RMM) port shall interface with an external processor's standard RS-232C serial data port. The CD-2's RMM interface shall have the following salient characteristics:

(a)   ASCII characters transmitted with their most significant bit equal to zero, and binary data transmitted in 8-bit format.

(b)   RS-232C electrical characteristics.

(c)   Half duplex operation (1200 to 9600 baud, synchronous) over an RS-232C-compatible cable with a length of at least 50 feet.

(d)   Hardware handshaking using the request-to-send (RTS) and clear-to-send (CTS) control signals.

(e)   Bit ordered data link protocol in compliance with the ANSI BSR X3.66 standards for Class UN options 1(b), 2, 4, 5 and 6, with the following exceptions:

    (1)   Extended Length Frame Check Sequence (FCS) Fields (ADCCP 3.5). Only the normal 16-bit FCS will be supported.

    (2)   Asynchronous Response Opportunity (ARO) Detection (ADCCP 6.2.2) will not be supported.

    (3)   Asynchronous Response (ARM) and Asynchronous Balanced (ABM) Modes will not be supported. In particular, the following commands are excluded: SARM, SABM, SARME, SABME and XID.

    (4)   Extended addressing will not be supported.

    (5)   Extended control fields will not be supported.

The demarcation point for the RMM port shall be a DB-25S or equivalent connector located on the maintenance console's backplane. The CD-2's RMM port shall be designated as a data terminal.

3.4.2.1.4.4 Remote Maintenance and Monitoring Message Formats. - The contractor shall provide to the FAA at a formal design review a specific and complete RMM message format design. The basic formats of Table X herein shall be used as the basis for this design. The contractor's proposed format shall identify and list each message type and its complete bit assignment, along with a description of how it is to be used within the overall RMM functional operation. The proposed message design shall describe and define the following at a minimum:

(a)   The response of the interface to, or its implementation of, the following:

    (1)   Receipt of an invalid information request.

    (2)   Verification of command completion.

      (3)   Local enable or disable of the remote operating mode.

(b)   The remainder of the message arguments (2...N) for the command message (type A of Table X herein).

(c)   The error codes for the status message (type C of Table X herein).

(d)   The best method of status readback via the status message.

(e)   The organization, contents and best use of the data request and data (readback) messages (types C and D of Table X herein).

FAA approval of the proposed design and use of the RMM message formats shall be obtained from the Contracting Officer before beginning production of the RMM function.".

Page 66, paragraph 3.4.3.1.2.2.3.4: Change the parenthetical sentence added by Amendment 1 to read in part as follows: "... no intensity level inversions in the contour data displayed on the maintenance console ppi or rappi, or reported to the system data bus occur...".

Page 67, paragraph 3.4.3.1.2.2.3.5, line 11: Immediately after the existing fourth sentence add the following: "Any combination of the eight thresholds shall be able to be selected for reporting by the STE to the system data bus. This selection as well as the selection of which thresholds are to be reported to the FAA as light, medium, and heavy weather shall be made from the front panel of the maintenance console.".

Page 73, paragraph 3.4.3.1.3.1.1: In the second paragraph, change the sixth sentence (which was modified by Amendment 1) to read in part as follows: "... from the front panel of the maintenance console, including a manual override of the automatic selection of the ADC while an external azimuth alarm exists.".

Page 75, paragraph 3.4.3.1.3.3.1: Immediately after existing subparagraph (e) add the following: "(f) Prepare up to and including three types of weather messages (as determined from the front panel) from the up to eight types provided by the STE.".

Page 76, paragraph 3.4.3.1.3.3.2: Delete in its entirety the last sentence in the first (partial) subparagraph at the top of the page (which ends "... status messages shall be inhibited during the overflow condition."), and substitute therefor: "Low level weather messages, and only those messages, shall be prohibited from entering the queue when the buffer becomes 65 percent full, and reallowed to enter when the buffer has emptied out to a 55 percent full threshold. All weather messages shall be inhibited when the overload condition is present, and all messages except status messages shall be inhibited during the overflow condition.".

Page 78, paragraph 3.4.3.1.3.4.2: Add the following immediately after the ninth sentence (which ends "... targets generated in each CD-2 channel."): "These controls shall not accept operator inputs which the test target generators cannot support or implement correctly. For instance, no second-time around or other incorrect outputs shall be possible. Error indications shall be provided in the event that settings which would cause such outputs are entered.".

Page 85, paragraph 3.4.3.1.4.1.2.1: Delete the second sentence and substitute: "Except for the displaying of the emergency symbol which shall always be enabled, each symbol shall be selected for display by individual front panel controls; however, in the instance of the eight weather contour symbols it is permissible to use more than one control to select the symbols to be displayed, providing that individual control over each symbol is still achieved.".

Page 86, paragraph 3.4.3.1.4.1.2.1: Immediately after existing subparagraph (n), add the following: "(o) Medium Intensity Weather (I) - This symbol shall be displayed twice at the azimuth contained in each medium intensity weather message, once at the start range and once at the stop range.".

Page 87, paragraph 3.4.3.1.4.1.2.1: Delete the existing subparagraph (o) and substitute the following therefor:

"(p) Other Weather Symbols - The display shall provide the capability to uniquely display each of the eight weather contours provided by the STE on the system data bus. The spare symbols (H) and (M) shall be used along with the low, medium and high weather intensity symbols defined above to partially satisfy this requirement. Other symbols of the contractor's choosing shall be utilized to display at least the three remaining weather contours. These symbols shall be approved in writing by the contracting officer before the 3-level weather modification is released for production. Each symbol shall be displayed twice per message as specified above for the other weather symbols.".

Page 87, paragraph 3.4.3.1.4.1.2.1: Reidentify existing subparagraph "(p)" to "(q)."

Page 92, paragraph 3.4.3.1.4.4: Change the third complete sentence (which ends "... require no such readback.") to read in part: "... controlled by the keyboard, including the maintenance test targets (3.4.3.1.3.4.2), the AIMS test targets (3.4.3.1.5.1.5), and the MIG's digital Mode 4 and height request test messages (3.4.3.1.5.5.2).".

Page 109, paragraph 3.4.3.1.6: Delete the first sentence in its entirety and substitute the following therefor:

"The operational control of the complete CD-2 shall be able to be exercised from either the front panel of the maintenance console or from external equipment via the RMM function (3.4.3.1.6.1). Selection of which control method is active shall be as specified in 3.4.3.1.6.1."

<u>Page 111, paragraph 3.4.3.1.6</u>: Add the following immediately after subparagraph (ag):

 "(ah) Remote control, on-off
 (ai)   Individual channel alarm history reset".

<u>Page 111</u>. Add the following immediately after the last paragraph of paragraph <u>3.4.3.1.6</u>:

"<u>3.4.3.1.6.1 Remote maintenance and monitoring</u>.- The CD-2's maintenance console shall provide the capability such that the CD-2 can be monitored and controlled by external equipment or from the front panel of the maintenance console. The remote control and monitoring shall be accomplished via the remote maintenance and monitoring (RMM) interface (3.4.2.1.4.3) using the message formats of 3.4.2.1.4.4. Unless otherwise authorized by the Contracting Officer before the completion of RMM performance testing (4.3.3.2), the RMM function shall provide the capability of remotely accomplishing each of the functions that can be otherwise accomplished from the keyboard on the maintenance console, including those functions of 3.4.3.1.6, subparagraphs (ah) and (ai). In addition, the capability to remotely and independently accomplish a hardware reset (power-on clear) for each complete CD-2 channel (including the MIG and maintenance console if they are connected to that channel's data bus) shall be provided.

The remote control (on-off) control function shall be implemented such that, even when operating in the remote control mode with the keyboard locked, it shall be possible to regain full local (front panel of the maintenance console) control of the CD-2 by means of a series of keyboard or other front panel entries. This series of entries shall be the same for all CD-2 systems and shall be able to be easily altered by changing only the RMM software in the maintenance console. The specific series of entries shall be proposed to the FAA and approved in the same manner as shall be the RMM message formats (3.4.2.1.4.4).

The RMM function shall accept and cause the execution of all legitimate commands for the appropriate CD-2 system type. It shall return an error message for each instance when a command or data request was not (or was not able to be) carried out successfully.

Each information exchange will begin with a link-level command, a command message or a data request message, and shall result in an appropriate response by the CD-2 within 5 seconds. The exchanges shall not be conversational, i.e., a prompt-entry-response type of exchange. Thus, the remote control equipment shall not be considered to be an extension of the maintenance console's tabular display where pages are able to be rewritten in response to certain CD-2 actions. Accordingly, the CD-2 RMM processor shall insure that each command is actually and successfully executed before an acknowledgement of its completion (or its receipt) is transmitted to the remote control equipment.

The RMM function shall be implemented using no more than three of the small spare CCA slots in the maintenance console and no more than 50 percent of the reserve capacity of the maintenance console power supply. (This is a specific modification, applicable to the RMM function only, of the growth requirements of 3.4.1.8 herein.) The RMM CCA(s) shall be designed and constructed in accordance with all applicable requirements of paragraph 3.5 herein.

3.4.3.1.6.1.1 RMM modification kit.- When so required by the contact, the contractor shall provide a separately packaged kit that will allow Government personnel familiar with the CD-2 to modify a CD-2 system that was not built with the RMM function integral to it in order to add the RMM capability of 3.4.3.1.6.1. The modification kit shall be provided with documentation that includes at least a kit parts list, modification theory description, and both installation and test after modification (checkout) procedures suitable for use by field personnel.".

Page 111, paragraph 3.4.3.1.7.1: Change the second sentence of the first paragraph to read in part: "...as shall the channel selection function and the results of...".

Add the following paragraph immediately after the present second paragraph:

"The system monitor in the CIM of each channel shall maintain its own independent history, as well as the current status, of each of the alarm conditions monitored. The history shall represent all of the alarms that have been declared in that CD-2 channel since the last manual alarm history reset or channel reinitiation, while the current status reflects the alarm condition of the CD-2 channel at the present time. The alarm history reset shall be a momentary-enable function. It shall be able to be locally or remotely activated, independently for each CD-2 channel, as specified in 3.4.3.1.6 and 3.4.3.1.6 (aj).".

Page 112, paragraph 3.4.3.1.7.2.1: Add the following to the end of the paragraph: "The azimuth/synchro alarm bit shall not be set by the loss of search or beacon trigger inputs when the CD-2's azimuth signal inputs are correct.".

Page 113, paragraph 3.4.3.1.7.2.2: In the first paragraph, change the seventh sentence (which begins "The visual alarm indicators shall be able to be reset...") to read in part as follows:

"When the separate alarm history and current status record keeping capability of 3.4.3.1.7.1 is not provided, the visual alarm indicators shall be able to be reset...".

Delete the second sentence of subparagraph (ii) and substitute the following: "The RMM function, when provided, shall permit these manual alarm resets to be remotely accomplished using a single command-response message pair. The alarms which are integrated to determine if the alarm condition has cleared shall be reset within 2 minutes; all other alarms shall be reset within 2 seconds of the initiating command.".

Add the following immediately after subparagraph (ii):

"When the separate alarm history and current status record keeping capability of 3.4.3.1.7.1 is provided, the visual alarm indicators shall represent the current status of the alarms.".

Page 114, paragraph 3.4.3.1.7.2.3: Add the following immediately after the second sentence (which ends "... display in the maintenance console."): "When the separate alarm history and current status record keeping capability of 3.4.3.1.7.1 is provided, the tabular display shall be able to separately display the current and historical alarm records. These records and their tabular display formats shall have at least 10 percent of the record size (but not less than 8 bits plus one display byte of two hexadecimal characters) of growth for future use.".

In the first paragraph, change the last sentence (which ends "... which require no such readback.") to read in part: "... and all other similar controls, including the maintenance test target (on-off) controls.".

Page 175, paragraph 4.3.3.2: Add the following, immediately after subparagraph (o):

"(p)   Remote maintenance and monitoring   3.4.3.1.6".

Page 178, paragraph 4.3.5: Delete subparagraph (d) in its entirety and substitute the following therefor:

"(d)   A more comprehensive test, to include the use of data entry devices and other normal operating controls, including remote controls, shall be performed at least every 12 hours. The RMM portion of the test shall include at least one data readback and the changing of at least the following controls:

(1)   On-line channel
(2)   Maintenance console channel
(3)   Modem channel, on-off
(4)   Beacon test target, set up and operation
(5)   Beacon run length reporting, on-off
(6)   Beacon RTQC code, one-zero
(7)   Beacon offset, on-off
(8)   Search manual crossover, set up and on-off
(9)   Remote control, on-off
(10) Hardware reset of the off-line channel.".

<u>Page 180, paragraph 4.3.7:</u> Add the following subparagraph immediately after
subparagraph (c):

"(d) The test shall verify the proper operation of the RMM capability for at
least the following functions:

(1) Channel change
(2) Status request and readback
(3) Modem channel, on-off
(4) Beacon test target, set up and operation
(5) Beacon run length reporting, on-off
(6) Beacon RTQC code, one-zero
(7) Beacon offset, on-off
(8) Search manual crossover, set up and on-off
(9) Remote control, on-off
(10) Hardware reset of the on-line channel.".

<u>Page 198, Table II, (page 2 of 2):</u> Make the following changes in the status message
format:

a. Bit 34: Change "SEARCH MAX RLD ON" to "SEARCH RLD ON"

b. Bit 35: Change "SEARCH MIN RLD ON" to "CD-2 CHANNEL (1=A)"

c. Bit 42: Change "0" to "WEATHER REPORTING RESTRICTED".

<u>Page 198, Table II, (page 2 of 2):</u> Replace the existing map message format with the
following:

FLD CNT	BIT CNT	MSG BIT NO.	MAP	
1	12	1	TEST	
	11	2	0	
	10	3	0	
	9	4	0	
	8	5	0	
	7	6	0	
	6	7	0	
	5	8		
	4	9	Map Variation*	
	3	10		
	2	11	FAA	
	1	12	AF	
	0	13	PARITY	
2	12	14	MSB	128 NM
	11	15		64
	10	16		32
	9	17		16
	8	18	RANGE START	8
	7	19	(10)	4
	6	20		2
	5	21		1
	4	22		.5
	3	23		.25 NM
	2	24	0	
	1	25	0	
	0	26	PARITY	

FLD CNT	BIT CNT	MSG BIT NO.	MAP	
3	12	27	MSB	2048 ACP
	11	28		1024
	10	29		512
	9	30		256
	8	31		128
	7	32	AZIMUTH	64
	6	33	(12)	32
	5	34		16
	4	35		8
	3	36		4
	2	37		2
	1	38	LSB	1
	0	39	PARITY	
4	12	40	MSB	128 NM
	11	41		64
	10	42		32
	9	43		16
	8	44		8
	7	45	RANGE STOP	4
	6	46	(10)	2
	5	47		1
	4	48		
	3	49		
	2	50	0	
	1	51	0	
	0	52	PARITY	

*Map variation bits shall denote the types of weather map messages as follows:

Map Type	Bit 8	Bit 9	Bit 10
Light weather	1	1	0
Medium weather	0	0	0
Heavy weather	1	0	1

Page 204, Table VIII: For Bit 34, change the Meaning entry from "Search maximum RLD" to "Search RLD on".

For Bit 35, change the Meaning entry from "Search minimum RLD" to "Selected CD-2 Channel", and change the Condition Which Sets the Bit entry to read" "Manual or automatic selection of CD-2 Channel A as the on-line channel".

For Bit 40, change the Condition Which Sets the Bit entry to read in part: "... whenever weather reporting is totally inhibited by the ...".

For Bit 42, change the Meaning entry from "Not Assigned" to "Restricted Weather Reporting", and change the Condition Which Sets the Bit entry to read: "Inhibition of the reporting of low level weather because of excessive loading of the CIM's output buffer".

Page 204/1, Table IX: To the list of circuit and assemblies under "MC", add the following:

   "RMM processor(s), if applicable".

Page 204/1: Add page 204/2, copy attached hereto, immediately after page 204/1.

Page 207: Add the following immediately after the index listing for paragraph 3.4.2.1.4.2:

Page 210: Add the following immediately after the index listing for paragraph 3.4.3.1.6:

Page 216: Add the following immediately after the table listing for Table XI:

* * * * *

Command Message (Type A) - to CD-2

Field	No. Bits	ASCII Value	Additional Information
Message Function	8	A	Identifies the command message
Command ID	8	*	Identifies command type
Argument 1	16	*	Specify the command or commands explicitly
Arguments 2, 3...N	*	*	

Data Request Message (Type B) - to CD-2

Field	No. Bits	ASCII Value	Additional Information
Message Function	8	B	Identifies the data request message
Group ID	*	*	Identifies the group number

Status Message (Type C) - from CD-2

Field	No. Bits	ASCII Value	Additional Information
Message Function	8	C	Identifies the status message
Status	*	*	Returned status

Data Message (Type D) - from CD-2

Field	No. Bits	ASCII Value	Additional Information
Message Function	8	D	Identifies the data message
Group ID	*	*	Identifies the group number
Argument 1...N	*	*	Data points one through "N"

* To be determined

TABLE X. Basic RMM Message Format